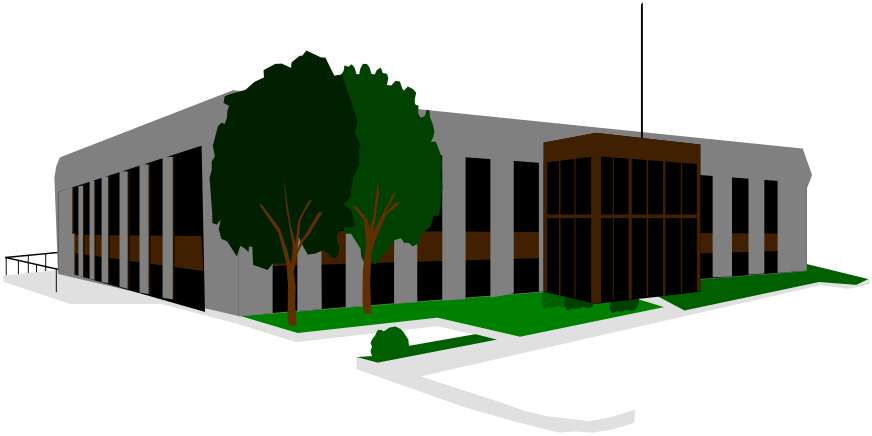
# INDOOR AIR QUALITY ASSESSMENT

**Johnson Elementary School**
**290 Castle Road**
**Nahant, Massachusetts**



Prepared by:
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Bureau of Environmental Health Assessment
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## Background/Introduction

At the request of a parent and Principal Tom LaValley, the Bureau of Environmental Health Assessment (BEHA) conducted an evaluation of the indoor air quality at the Johnson Elementary School in Nahant on December 19, 2000. Cory Holmes, Environmental Analyst for BEHA's Emergency Response/Indoor Air Quality (ER/IAQ) program, conducted the assessment. Concerns about mold growth, respiratory irritation and exacerbation of asthma prompted this request. A letter with preliminary advice was issued giving recommendations on how to improve indoor air quality regarding mold growth and moisture issues within the building (MDPH, 2000) (See Attachment).

The school is a multi-level, red brick structure constructed in 1954. An addition was built in the early 1960's. The school consists of general classrooms, library, cafeteria/auditorium, computer room and office space. Windows are openable in the building.

## Methods

Air tests for carbon monoxide, carbon dioxide, temperature and relative humidity were taken with the TSI, Q-Trak, IAQ Monitor, Model 8551.

## Results

The school housed grades K-6 and has a student population of 229 and a staff of approximately 40. The tests were taken during normal operations. Test results appear in Tables 1-5.

## Discussion

### Ventilation

It can be seen from the tables that carbon dioxide levels were elevated above 800 parts per million of air (ppm) in nineteen of twenty-five areas surveyed, which indicates an overall ventilation problem in the school. It should also be noted that several of these areas had low occupancy and/or open windows, which can greatly contribute to reduced carbon dioxide levels. Of note were classrooms 5, 6 and the computer room, which had carbon dioxide measurements above 800 ppm with no occupancy, indicating little or no air exchange.

Fresh air in classrooms is supplied by a unit ventilator (univent) system (see Picture 1). Univents draw air from outdoors through a fresh air intake located on the exterior walls of the building (see Picture 2) and return air through an air intake located at the base of each unit (see Figure 1). Fresh air and return air are mixed, filtered, heated and provided to classrooms through a fresh air diffuser located in the top of the unit. Mr. LaValley reported that outside air intakes had been sealed with plywood for a number of years as an energy conservation measure. Obstructions to outside air intakes were removed during the summer of 2000 and a heating, ventilating and air conditioning (HVAC) engineering firm was hired to assess univents and make to repairs. According to Mr. La Valley a number of air intake accuators were disconnected, which were re-

connected by the HVAC firm. Filters were also changed and the interiors of univents were reportedly cleaned prior to operating. Several univents remain inoperable due to mechanical problems. The univents in classroom 3 and the art room were noisy, which may indicate a mechanical problem.

In addition, as a result of temperature fluctuations, classroom occupants have deactivated or requested that their classroom univents be deactivated. Without univents operating, the HVAC system does not function as designed, preventing fresh outside air from being distributed to classrooms.

Obstructions to airflow, such as books, papers and posters on top of univents, and bookcases, tables and desks in front of univent returns were also seen in a number of classrooms (see Picture 3). To function as designed, univent fresh air diffusers and return vents must remain free of obstructions. It is important that these units be activated and allowed to operate during school hours.

The mechanical exhaust ventilation system in each classroom consists of ducted, grated wall vents powered by rooftop exhaust motors (see Pictures 4 & 5). Mr. LaValley reported that the schools exhaust system had been deactivated for approximately ten years. Some rooftop exhaust motors were reactivated, some of them irreparable. BEHA staff found these vents deactivated and backdrafting in a number of classrooms, indicating exhaust motors were off or non-functional. As with the univents, a number of exhaust vents were obstructed by tables, chairs, boxes and other items (see Picture 6). No exhaust ventilation could be identified in the library. Without adequate exhaust ventilation, excess heat and environmental pollutants can build up and lead to indoor air complaints.

The mechanical ventilation systems for the cafeteria and gymnasium were also found deactivated during the assessment. In both areas carbon dioxide levels measured above 800 ppm indicating inadequate ventilation. It was reported by Mr. La Valley that the gymnasium air-handling unit (AHU) was deactivated due to mechanical problems. A number of restroom exhaust vents were also not operating during the assessment. It is important to provide exhaust ventilation in restrooms to remove moisture and to prevent odors from migrating into adjacent areas.

To maximize air exchange, the BEHA recommends that both supply and exhaust ventilation operate continuously during periods of school occupancy. In order to have proper ventilation with a univent and exhaust system, the systems must also be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. The date of the last balancing of these systems was not available at the time of the assessment.

The Massachusetts Building Code requires a minimum ventilation rate of 15 cubic feet per minute (cfm) per occupant of fresh outside air or have openable windows in each room (SBBRS, 1997; BOCA, 1993). The ventilation must be on at all times that the room is occupied. Providing adequate fresh air ventilation with open windows and maintaining the temperature in the comfort range during the cold weather season is impractical. Mechanical ventilation is usually required to provide adequate fresh air ventilation.

Carbon dioxide is not a problem in and of itself. It is used as an indicator of the adequacy of the fresh air ventilation. As carbon dioxide levels rise, it indicates that the ventilating system is malfunctioning or the design occupancy of the room is being

exceeded. When this happens, a buildup of common indoor air pollutants can occur, leading to discomfort or health complaints. The Occupational Safety and Health Administration (OSHA) standard for carbon dioxide is 5,000 parts per million parts of air (ppm). Workers may be exposed to this level for 40 hours/week, based on a time-weighted average (OSHA, 1997).

The Department of Public Health uses a guideline of 800 ppm for publicly occupied buildings. A guideline of 600 ppm or less is preferred in schools due to the fact that the majority of occupants are young and considered to be a more sensitive population in the evaluation of environmental health status. Inadequate ventilation and/or elevated temperatures are major causes of complaints such as respiratory, eye, nose and throat irritation, lethargy and headaches.

Temperature readings ranged from 64$^{o}$ F to 77$^{o}$ F, which were within the BEHA recommended range in most areas. The BEHA recommends that indoor air temperatures be maintained in a range of 70$^{o}$ F to 78$^{o}$ F in order to provide for the comfort of building occupants. Although most of the temperatures were within BEHA guidelines on the day of the assessment, a number of temperature control complaints were expressed to BEHA staff. It is difficult to control temperature and maintain comfort without the HVAC equipment operating as designed. Heat complaints were reported in the computer room, which contained 25 (+) computers and a number of printers. This area is not equipped with air conditioning. Computer equipment and printers can generate waste heat while they operate, which can build up over time. In many cases concerning indoor air quality,

fluctuations of temperature in occupied spaces are typically experienced, even in a building with an adequate fresh air supply.

The relative humidity in the building was below the BEHA recommended comfort range in all occupied areas sampled. Relative humidity ranged from 22 to 35 percent. The BEHA recommends that indoor air relative humidity is comfortable in a range of 40 to 60 percent. Relative humidity levels in the building would be expected to drop during winter months due to heating. The sensation of dryness and irritation is common in a low relative humidity environment. Low relative humidity is a very common problem during the heating season in the northeast part of the United States. While temperature is mainly a comfort issue, relative humidity in excess of 70 percent can provide an environment for mold and fungal growth (ASHRAE, 1989). Relative humidity in the steam pump room measured 85 percent, which was addressed in previous BEHA correspondence (MDPH, 2000).

**Microbial/Moisture Concerns**

Pooling water was observed in a number of areas on the roof (see Picture 7). The freezing and thawing of water during winter months can lead to roof leaks and subsequent water penetration into the interior of the building. Pooling water can also become stagnant, which can lead to mold and bacterial growth. In addition, stagnant pools of water can serve as a breeding ground for mosquitoes.

Plants were noted in several classrooms. Plants should be equipped with drip pans and over watering should be avoided. In some classrooms containers of old potting soil or

plants in standing water were observed (see Pictures 8 & 9). Moistened plant soil, drip pans and standing water can serve as sources of mold and bacteria growth and be a source of unpleasant odors. Plants should also be located away from univents to prevent the aerosolization of dirt, pollen or mold.

Throughout the school, caulking around the interior and exterior windowpanes was crumbling, missing or damaged (see Picture 10). Repairs of window leaks are necessary to prevent water penetration. Repeated water damage can result in mold colonization of window frames, curtains and items stored on or near windowsills.

Along the perimeter of the building, some of the univent fresh air intakes are located at ground level (see Picture 1). Care should be taken to ensure that fresh air intakes remain clear of obstructions (e.g., snow, shrubbery) to avoid the entrainment of dirt, moisture and or pollen.

**Other Concerns**

A number of other conditions that can potentially affect indoor air quality were observed. Cleaning products were found on countertops and beneath sinks in a number of classrooms. Cleaning products contain chemicals, which can be irritating to the eyes, nose and throat and should be stored properly and kept out of reach of students. The boiler room hallway, which is used for storage, contained a mimeograph machine and containers of duplicating fluid (see Picture 11). Mimeograph duplicating fluid contains methanol (methyl alcohol), which is a volatile organic compound (VOC) that readily evaporates at room temperature. The off gassing of this material can be irritating to the eyes, nose and

throat. Methanol is also a highly flammable material, which can be ignited by either flame or electrical source.

Several classrooms contained dry erase boards and dry erase markers. Materials such as dry erase markers and dry erase board cleaners may contain VOCs, (e.g., methyl isobutyl ketone, n-butyl acetate and butyl-cellusolve) (Sanford, 1999), which can be irritating to the eyes, nose and throat. Accumulated chalk dust was noted in several classrooms (see Picture 12). Chalk dust is a fine particulate, which can be easily aerosolized and is an eye and respiratory irritant. Several areas had missing ceiling tiles. Missing ceiling tiles can provide an egress for dirt, dust and particulate matter into occupied areas. These materials can also be irritating for certain individuals.

Also of note was the amount of materials stored inside classrooms (see Picture 13). Items were seen piled on windowsills, tabletops, counters, bookcases and desks in classrooms throughout the school. The large amount of items stored allows for dusts and dirt to accumulate. These stored items, (e.g., papers, folders, boxes) make it difficult for custodial staff to clean. Dust can be irritating to the eyes, nose and respiratory tract.

A wasp's nest was displayed in one classroom, which serves as a learning tool (see Picture 14). Insect parts can become dried out and aerosolized and may serve as a source of allergenic material for sensitive individuals. Exposed fiberglass insulation was noted in the former kitchen area and in the hallway around pipes in the 1964 addition (see Picture 15). If damaged, fiberglass insulation material can release fibers and be a source of skin, eye and respiratory irritation.

A strong scent of deodorizer was detected in the resource room. Air fresheners may contain chemicals that can be irritating to the eyes, nose and throat in sensitive individuals. In addition, air fresheners do not remove materials causing odors, but rather mask odors which may be present in the area.

## Conclusions/Recommendations

Occupant symptoms and complaints are consistent with what might be expected in a building with a poorly operating ventilation system. The combination of the building design, maintenance of equipment and the condition of stored materials in the building can contribute to poor indoor air quality. Mechanical ventilation components in the gym, cafeteria and in classrooms do not function as originally designed. Without adequate supply and exhaust ventilation, normally occurring indoor air pollutants can build up and linger in occupied areas. The use of odor or dust generating materials can also serve to exacerbate irritation of eyes, nose and throat in sensitive individuals.

For this reason a two-phase approach is required, consisting of immediate (**short-term**) measures to improve air quality within the school and **long-term** measures that will require planning and resources to adequately address overall indoor air quality concerns.

In view of the findings at the time of this assessment, the following **short-term** recommendations are made:

1. Implement recommendations listed in previous BEHA correspondence (MDPH, 2000).
2. Continue working with HVAC engineering firm restore the ventilation system. Have HVAC firm fully evaluate existing ventilation components for function and reparability.
3. To maximize air exchange, the BEHA recommends that both supply and exhaust ventilation operate continuously during periods of school occupancy independent of activation by classroom thermostat control.
4. Reactivate restroom exhaust ventilation to remove excess moisture and odors.
5. Remove all blockages from univent fresh air diffusers, return vents and exhaust vents to facilitate airflow.
6. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, the use of a HEPA filter equipped vacuum cleaner in conjunction with wet wiping of all non-porous surfaces is recommended. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
7. Repair any water leaks and replace any remaining water-stained ceiling tiles. Examine the areas above these tiles for mold growth. Disinfect areas of water leaks with an appropriate antimicrobial as needed.

8. Relocate or consider reducing the amount of materials stored in classrooms to allow for more thorough cleaning. Clean items regularly with a wet cloth or sponge to prevent excessive dust build-up.
9. Move plants away from univents and ensure drip pans are placed underneath plants in classrooms. Examine plants in classrooms for mold growth in water catch basins. Disinfect water catch basins if necessary.
10. Acquire current Material Safety Data Sheets for all products that are used in the building that contain hazardous materials, including office supplies, in conformance with the Massachusetts Right-To-Know Law, M.G.L. c. 111F (MGL, 1983).
11. Store chemicals and cleaning products properly and out of the reach of students.
12. Consider bringing in wasps' nest on an "as needed" basis to prevent exposure to potentially allergenic materials.
13. Clean chalkboards and chalktrays regularly to prevent the build-up of excessive chalk dust.
14. Encapsulate damaged/exposed fiberglass in former kitchen area and in the 1964-addition hallway.
15. Store flammable materials in flameproof cabinets in a manner consistent with state and local fire codes.
16. Refrain from using strong scented materials in classrooms and restrooms.

The following **long-term measures** should be considered:

1. As previously discussed, the age, physical condition and availability of parts for the mechanical ventilation systems throughout the school should be fully evaluated by an HVAC engineering firm to determine the operational lifespan of existing equipment and/or examining the feasibility of replacement.
2. Repair/replace missing or damaged window caulking building-wide to prevent water penetration through window frames.

## References


BOCA. , 1993. The BOCA National Mechanical Code/1993. 8th ed. Building Officials and Code Administrators International, Inc., Country Club Hill, IL. Section M-308.1.1.

MDPH. 2000. Letter to Cecilia Di Bella, Superintendent, Nahant Public Schools, Regarding Indoor Air Quality Issues at the Johnson Elementary School, Nahant, MA. Massachusetts Department of Public Health, Bureau of Environmental Health Assessment, Boston, MA. December, 2000.

MGL. 1983. Hazardous Substances Disclosure by Employers. Massachusetts General Laws. M.G.L. c. 111F.

OSHA. 1997. Limits for Air Contaminants. Occupational Safety and Health Administration. Code of Federal Regulations. 29 C.F.R 1910.1000 Table Z-1-A.

Sanford. 1999. Material Safety Data Sheet (MSDS No: 198-17). Expo® Dry Erase Markers Bullet, Chisel, and Ultra Fine Tip. Sanford Corporation. Bellwood, IL.

SBBRS. 1997. Mechanical Ventilation. State Board of Building Regulations and Standards. Code of Massachusetts Regulations. 780 CMR 1209.0

**Picture 1**

**Classroom Univent**

**Picture 2**

**Univent Outside Air Intake, Note Location to Ground**

**Picture 3**


**Univent Obstructed by Various Items**

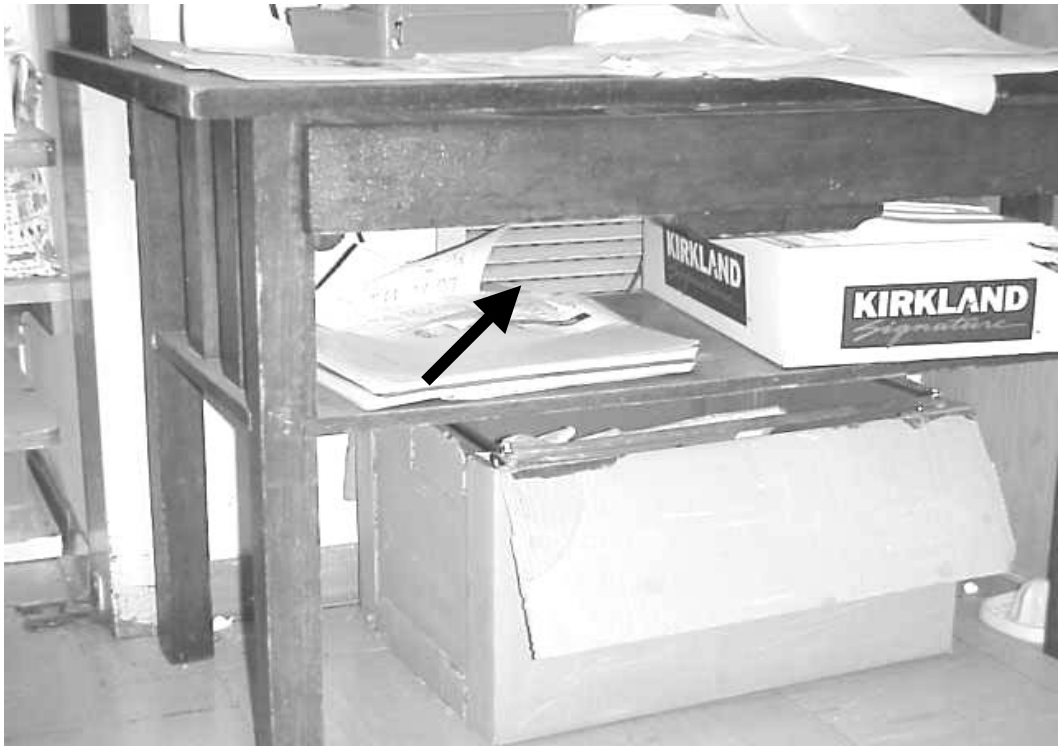
**Picture 4**

**Wall-Mounted Exhaust Vent**

**Picture 5**

**Rooftop Exhaust Motor**

**Picture 6**




**Obstructed Wall-Mounted Exhaust Vent**

**Picture 7**

**Pooling Water on Roof**

**Picture 8**

**Container of Potting Soil Found beneath Sink in Classroom**

**Picture 9**

**Plant in Standing Water in Classroom**

**Picture 10**

**Crumbling/Damaged Window Caulking**

**Picture 11**


**Container of Duplicating Fluid**

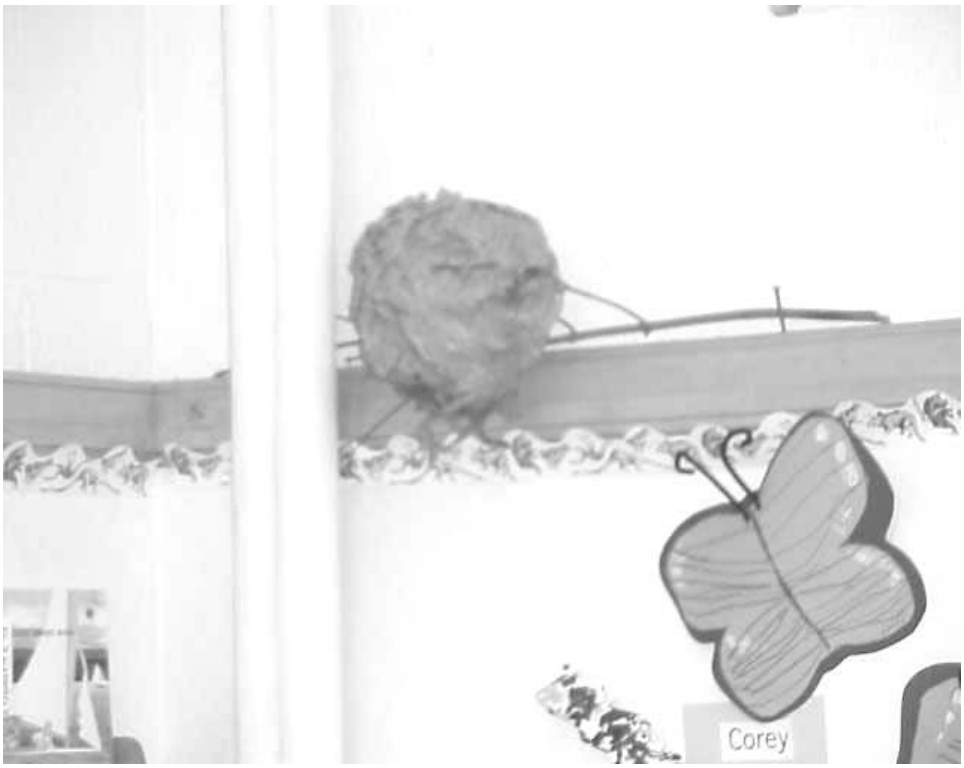
**Picture 12**

**Accumulated Chalk Dust in Classroom**

**Picture 13**

**Accumulated Items in Classroom**

**Picture 14**




**Hornet/Wasp's Nest in Classroom**

**Picture 15**

**Exposed Fiberglass Insulation in Former Kitchen Area**

**TABLE 1**

## Indoor Air Test Results – Johnson Elementary School, Nahant, MA – December 19, 2000

| Remarks | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| Outside (Background) | 410 | 55 | 22 | | | | | Weather conditions: cool and clear-slight breeze, CO=0 |
| Gymnasium | 1023 | 64 | 35 | 15 | No | Yes | Yes | Ventilation off-mechanical problems with AHU (bearing), dust/debris build up in exhaust vents (off), CO=0 |
| Nurse's Office | 706 | 68 | 33 | 1 | Yes | No | No | Window open, plant, restroom exhaust off |
| Boys' Restroom "54"-1st floor | | | | 0 | Yes | Yes | Yes | Passive intake, exhaust off |
| Girls' Restroom | | | | 0 | Yes | Yes | Yes | Passive intake, exhaust off |
| 1 | 1800 | 71 | 32 | 11 | Yes | Yes | Yes | Exhaust off, exhaust grills dirty/dusty, univent off-activated-blasting heat, temperature complaints-heat, plant, CO=0 |
| 2 | 1044 | 75 | 23 | 17 | Yes | Yes | Yes | Univent and exhaust off, door open, 9+ plants, stored items, temperature complaints-heat, CO=0 |
| 3 | 1308 | 75 | 27 | 12 | Yes | Yes | Yes | Univent "buzzing", exhaust off, 2 plants |

*** ppm = parts per million parts of air**
**CT = ceiling tiles**

**Comfort Guidelines**

| | |
|---|---|
| Carbon Dioxide - | < 600 ppm = preferred |
| | 600 - 800 ppm = acceptable |
| | > 800 ppm = indicative of ventilation problems |
| Temperature - | 70 - 78 °F |
| Relative Humidity - | 40 - 60% |

**TABLE 2**

## Indoor Air Test Results – Johnson Elementary School, Nahant, MA – December 19, 2000

| Remarks | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| 4 | 1218 | 76 | 26 | 14 | Yes | Yes | Yes | Exhaust weak, CO=0 |
| Mrs. White | 788 | 76 | 22 | 18 | Yes | Yes | Yes | Window and door open, exhaust vent blocked by table/chairs, CO=0 |
| Mrs. McKenna | 984 | 72 | 28 | ~15 | Yes | Yes | Yes | Univent off-missing component, exhaust blocked by box/table, temperature complaints-heat, local exhaust in restroom-backdrafting cold air, old container of potting soil under sink-possible mold growth, bleach/isopropyl alcohol under sink, CO=0 |
| 5 | 1178 | 72 | 29 | 0 | Yes | Yes | Yes | Univent off-pans of standing water on top/debris, exhaust off-backdrafting |
| 6 | 1008 | 72 | 29 | 0 | Yes | Yes | Yes | 2 univents-off, exhaust off-backdrafting, 8+ plants, CO=0 |
| Computer Room | 992 | 72 | 29 | 0 | No | No | No | Carpet, 10 computers, dry erase board, CO=0 |
| Former Kitchen Area | | | | | | | | Exposed fiberglass insulation |

*** ppm = parts per million parts of air**
**CT = ceiling tiles**

**Comfort Guidelines**

| | |
|---|---|
| Carbon Dioxide - | < 600 ppm = preferred |
| | 600 - 800 ppm = acceptable |
| | > 800 ppm = indicative of ventilation problems |
| Temperature - | 70 - 78 °F |
| Relative Humidity - | 40 - 60% |

**TABLE 3**

## Indoor Air Test Results – Johnson Elementary School, Nahant, MA – December 19, 2000

| Remarks | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| Library | 1006 | 72 | 28 | 12 | Yes | Yes | No | Univent off, no exhaust identified, door open, CO=0 |
| J. Silva | 1100 | 74 | 30 | 12 | Yes | Yes | Yes | Univent return blocked, exhaust off, window open, 4 plants, chalk dust, CO=0 |
| Dunion | 1278 | 74 | 30 | 12 | Yes | Yes | Yes | Exhaust off, door open, CO=0 |
| Silva | 803 | 72 | 24 | 2 | Yes | Yes | Yes | 16 occupants gone ~25 mins., exhaust off, door open, CO=0 |
| Hennessey | 666 | 72 | 24 | 1 | Yes | Yes | Yes | Exhaust vent off-blocked, door open, chalk dust, CO=0 |
| Brady | 828 | 74 | 28 | 12 | Yes | Yes | Yes | Door open, CO=0 |
| Resource Room | 1107 | 76 | 28 | 2 | Yes | Yes | Yes | 2 occupants gone 5 mins., univent off, air freshener odor (strong), exhaust off |
| Hallway- ’64 Addition | | | | | | | | Damaged pipe insulation, exposed fiberglass |
| Steam Pump Room | 750 | 77 | 85 | 0 | Yes | No | Yes | Strong musty odor, extremely humid, paper/box storage, condensation dripping from ceiling, mold colonization on |

*** ppm = parts per million parts of air**
**CT = ceiling tiles**

**Comfort Guidelines**

| | |
|---|---|
| Carbon Dioxide - | < 600 ppm = preferred |
| | 600 - 800 ppm = acceptable |
| | > 800 ppm = indicative of ventilation problems |
| Temperature - | 70 - 78 °F |
| Relative Humidity - | 40 - 60% |

**TABLE 4**

## Indoor Air Test Results – Johnson Elementary School, Nahant, MA – December 19, 2000

| Remarks | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| | | | | | | | | walls/wooden windowsills/pipe insulation, small exhaust vent on, wooden door-water damaged/warped frame |
| Boys' Restroom-Basement | | | | 0 | Yes | Yes | Yes | Small window mounted exhaust vent, all other exhaust vents sealed |
| Reading Room | 1180 | 73 | 27 | 1 | Yes | Yes | Yes | Univent off, exhaust off-obstructed by computer cart |
| Boiler Room Hallway | | | | | | | | Duplicating fluid-flammable, unlocked, used for storage |
| Cafeteria | 1251 | 73 | 32 | ~175 | Yes | Yes | Yes | Ventilation off |
| Computer Room | 680 | 76 | 24 | 0 | Yes | Yes | Yes | Window and door open, exhaust blocked by box, 25+ computers, temperature complaints-heat, main frame/network |
| Art Room | 1163 | 75 | 30 | 15 | Yes | Yes | Yes | Univent off-"buzzing", exhaust blocked, door open, 9 plants, CO=0 |
| Rogers | 600 | 73 | 23 | 0 | Yes | Yes | Yes | 10 plants-1 in standing water, items on univent, exhaust off-backdrafting, door open |

*** ppm = parts per million parts of air**
**CT = ceiling tiles**

**Comfort Guidelines**

| | |
|---|---|
| Carbon Dioxide - | < 600 ppm = preferred |
| | 600 - 800 ppm = acceptable |
| | > 800 ppm = indicative of ventilation problems |
| Temperature - | 70 - 78 °F |
| Relative Humidity - | 40 - 60% |

**TABLE 5**

## Indoor Air Test Results – Johnson Elementary School, Nahant, MA – December 19, 2000

| Remarks | Carbon Dioxide *ppm | Temp. °F | Relative Humidity % | Occupants in Room | Windows Openable | Ventilation | | Remarks |
|---|---|---|---|---|---|---|---|---|
| | | | | | | Intake | Exhaust | |
| Preschool | 616 | 76 | 26 | 11 | Yes | Yes | Yes | Univent return blocked, window open, temperature complaints-heat extremes, CO=0 |

*** ppm = parts per million parts of air**
**CT = ceiling tiles**

**Comfort Guidelines**

| | |
|---|---|
| Carbon Dioxide - | < 600 ppm = preferred |
| | 600 - 800 ppm = acceptable |
| | > 800 ppm = indicative of ventilation problems |
| Temperature - | 70 - 78 °F |
| Relative Humidity - | 40 - 60% |